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LASER RANGING DATA ANALYSIS

Final Report for NASA Grant No. NAG5-1021
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CENTER FOR SPACE RESEARCH
THE UNIVERSITY OF TEXAS AT AUSTIN AUSTIN, TEXAS

LASER RANGING DATA ANALYSIS
NASA GRANT NAG5-1021

Final Report for 1987-1992
and
Annual Report for 1991-92

Center for Space Research efforts under NASA Grant NAG5-1021 have focused on the near real-time analysis of Lageos laser ranging data and on the production of predictive ephemerides. The data are analysed in terms of range bias, time bias, and internal precision, and estimates for the Earth orientation parameters X_p , Y_p and UT1 are obtained. The results of these analyses are reported in a variety of formats. Each week, a summary of the quick-look data and Earth orientation parameters are posted on the GE Mark III system, and electronically mailed to a number of researchers worldwide using BITNET and SPAN. Thus over 250 such reports were mailed to each member of the appropriate community during the period of this grant. Any results of the weekly analysis that point to anomalous station performance, and which may be previously unknown to the station personnel, are raised and discussed by UT/CSR representatives at the bi-weekly NASA Crustal Dynamics Project Telecon. This rapid feedback has enabled identification and correction of the problem's source with as little delay as possible in several cases.

In addition, during the last year (1991), several additional stations began sending not only quick-look observations but also normal points created on-site with new software. These normal points are transmitted in a new standard format different from either current quick-look or MERIT-II full-rate formats. Thus new preprocessing software was written and successfully tested on these data. UT/CSR further provided analysis of these normal points, including the discovery, discussion, and eventual correction of several format and processing errors. Such analyses has been useful to the groups implementing the corresponding software for the NASA supported stations.

Inspection of the Bendix produced Lageos full-rate normal points continued, with detailed analyses and filtering of all 1991 A and B release normal points for Lageos through the beginning of 1992. A summary of the combined full-rate and quick-look normal point data set created for 1991 is provided in Table 1.

Finally, new long-term ephemerides for Lageos satellite, as well as for Etalon-1 and Etalon-2, (the so-called high satellites used for laser ranging) were produced and distributed to the network stations in cooperation with the Crustal Dynamics Project and Eurolas. This is the fourth such ephemeris series produced under this grant. These predictions are used by essentially every laser ranging site obtaining regular returns from any of these three satellites.

Table 1. Summary of 1991 Lageos Residual Analysis
FR np Jan-Jun, QL np Jul-Dec

Station	No. of Passes	No. of 2-min np	number edited	percent edited	number kept	raw rms	rbtb rms	prec. est.
1181 POTSDM	29	246	71	28.9	175	9.4	6.0	4.7
1873 SIMEIZ	27	193	27	14.0	166	8.6	5.4	3.9
1884 RIGA	58	627	88	14.0	539	8.6	3.8	3.4
1953 SANCUB	27	184	105	57.1	79	9.9	6.1	5.3
7046 BRLAK2	60	844	10	1.2	834	2.3	0.6	0.5
7080 MCDON4	217	2403	32	1.3	2371	2.5	0.8	0.6
7090 YARAG	226	3875	54	1.4	3821	2.7	0.3	0.2
7097 EASTR2	43	512	1	0.2	511	3.1	1.1	1.0
7105 GRF105	175	2393	31	1.3	2362	2.5	0.5	0.4
7109 QUINC2	145	1754	23	1.3	1731	2.6	0.5	0.4
7110 MNPEAK	337	4932	52	1.1	4880	2.9	0.4	0.2
7112 PLATVL	28	345	6	1.7	339	4.2	0.8	0.7
7122 MAZTLN	70	1078	6	0.6	1072	2.4	0.4	0.2
7123 HUAHI2	48	558	8	1.4	550	3.6	1.2	1.1
7210 HOLLAS	288	4081	56	1.4	4025	2.9	1.0	0.7
7236 WUHAN	48	546	8	1.5	538	7.4	3.2	2.2
7288 MOJAV2	21	355	10	2.8	345	4.2	0.4	0.3
7295 RICHMO	53	777	18	2.3	759	4.2	0.6	0.5
7401 CERTOL	68	1019	12	1.2	1007	2.7	0.6	0.3
7403 ARELA2	126	1579	23	1.5	1556	3.4	0.9	0.7
7542 MONVEN	63	484	17	3.5	467	4.6	1.6	1.4
7560 RIGA2	12	84	1	1.2	83	2.5	1.0	0.8
7561 SIMEI2	34	493	6	1.2	487	3.7	0.6	0.5
7597 WET597	12	117	1	0.9	116	5.0	0.9	0.5
7810 ZIMMER	140	1835	11	0.6	1824	4.1	2.2	2.0
7811 BOROWC	12	71	5	7.0	66	7.7	4.0	3.6
7831 HELWAN	118	1167	5	0.4	1162	4.3	2.4	2.0
7834 WETZEL	17	187	4	2.1	183	2.7	1.2	1.1
7835 GRASSE	414	5762	100	1.7	5662	3.8	1.4	1.0
7837 SHAHAI	105	1053	123	11.7	930	8.0	4.3	3.6
7838 SHO	77	1081	21	1.9	1060	5.3	2.8	2.1
7839 GRAZ	153	2377	12	0.5	2365	2.8	0.7	0.5
7840 RGO	450	5201	38	0.7	5163	2.6	0.9	0.7
7843 ORRLLR	38	458	5	1.1	453	4.1	1.3	1.0
7883 ENSENA	25	360	4	1.1	356	3.2	0.7	0.6
7907 ARELAS	24	293	60	20.5	233	8.3	6.4	5.8
7918 GRF918	4	47	0	0.0	47	1.7	0.8	0.8
7920 GRF920	4	49	0	0.0	49	2.6	0.9	0.8
7939 MATERA	163	2004	102	5.1	1902	6.6	4.8	4.2
8834 WETZL2	307	3155	92	2.9	3063	5.1	1.5	1.2
TOTALS	4266	54579	1248	2.3	53331	3.9	1.7	1.4